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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/810,429	03/29/2004	Jacob Allen	AFD 668	9779

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EXAMINER	
COUGHLAN, PETER D	
ART UNIT	**PAPER NUMBER**
2129	

DATE MAILED: 06/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/810,429	ALLEN ET AL.
	Examiner	Art Unit
	Peter Coughlan	2129

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/29/2004*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

Detailed Action

1. Claims 1-13 are pending in this application.

Specification Rejections

2. The specification is rejected due to the following. Claims 3, 5, and 10 uses the term "adding one". Adding one what? Is it a value that is a total summation or is it a increase of a time interval. There are no units related to the addition of 'adding one'.

The specification is rejected due to the following. Claim 6 uses the acronym "IONFET". Inventors only use this word and the inventors have the right to create new words but a definition is needed to explain it. This word and it's definition are not in the U. S. Patent database, Google or in the IEEE database so the Examiner could not cross reference it.

The specification is rejected due to the following. Claim 4 uses the specification of the cycle time is "20KHz". This is not mentioned, addressed or explained in the specification at all.

Per the MPEP, section 608.01(l) the claim(s) is/are treated on its merits and a requirement made to amend the drawing and description to show the subject matter.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 3, 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsiung et al in view of Maass. (U. S. Patent Publication 20030144746, referred to as **Hsiung**; 'Pulsed Neural Networks', referred to as **Maass**)

Claim 1.

Hsiung teaches sensing odorants using a plurality of odor receptors (**Hsiung,** ¶0079); converting output of said sensing step to binary data. (**Hsiung,** ¶0180; 'Binary data' of applicant is equivalent to 'binary characteristics' of Hsiung.)

Hsiung does not teach inputting binary data from said converting step to a spiking neural network.

Maass teaches inputting binary data from said converting step to a spiking neural network. (**Maass,** Forward, xiii-xix; 'Spiking neural network' of applicant is equivalent to a 'Pulsed neural network' of Haass.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Hsiung by using binary input for use of a pulsed neural network as taught by Maass to binary data from said converting step to a spiking neural network.

For the purpose of being able to use a pulsed neural nework the input data has to be in binary form.

Hsiung teaches training said spiking neural network to learn most prevalent combination of odor receptors (**Hsiung,** abstract and ¶0033; Training the neural network is illustrated in the abstract and in association with olfactory sensors is illustrated in ¶0033.); and associating said combination of odor receptors from said training step with an output neuron. (**Hsiung,** abstract; This is how neural networks are trained, by comparing associating output to odor receptors.)

Claim 2.

Hsiung teaches the step of converting said binary data into spike trains comprising an adder/comparator combination having an input of zero representing a lack of odorant stimulus and an input of one representing an odorant stimulus. (**Hsiung,** ¶0129 and ¶0180; Combining olfactory sensors, each with a specific domain illustrated in ¶0129 and binary characteristics of ¶0180 of Hsiung would be equivalent to 'zero represents lack of stimulus' and 'one represents odorant stimulus' of applicant.)

Claim 3.

Hsiung teaches summing active inputs to a counter for every clock cycle of said adder/comparator combination. (**Hsiung,** table 5, name histogram; Each time segment of the histogram is the summation of the number inputs from the sensors)

Hsiung does not teach adding one to every clock cycle of said adder/comparator for every zero input; posting a spike to a spike bus every time said counter reaches a specified threshold; and resetting said counter to zero after said posting step.

Maass teaches adding one to every clock cycle of said adder/comparator for every zero input (**Maass,** p17, equation 1.12; Maass illustrates the summation per time interval '*t*'.); posting a spike to a spike bus every time said counter reaches a specified threshold (**Maass,** p17:9-13); and resetting said counter to zero after said posting step. (**Maass,** p18:1-2) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Hsiung by adding one for every zero input, firing the neuron when a threshold has been reached and then resetting the counter back to zero after the firing of the neuron as taught by Maass to add one to every clock cycle of said adder/comparator for every zero input; posting a spike to a spike bus every time said counter reaches a specified threshold; and resetting said counter to zero after said posting step.

For the purpose of setting standard guidelines when using a binary (pulsed) neural network.

Claim 8.

Hsiung teaches providing a spike bus including synchronization logic (**Hsiung,** ¶0066; Neural networks run in parallel which is equivalent to 'synchronization logic' of applicant.); connecting input signal from said receiving step to said spike bus using a priority encoder (**Hsiung,** ¶0456; 'Priority encoder' of applicant is equivalent to 'security requirements' of Hsiung.); posting address of said input signal on said spike bus using said priority encoder (**Hsiung,** ¶0456; 'Posting address' of applicant is equivalent to 'IP address' of Hsiung.); and connecting neuron modules in parallel to said spike bus by a potentiated synapse list. (**Hsiung,** ¶0008; The design of a neural network is one that runs in parallel. 'Synapse listing' of applicant is equivalent to 'model' of Hsiung.)

Claim Rejections - 35 USC § 103

4. Claims 4, 6, 7, 9, 10, 11, 12, 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Hsiung, and Maass, as set forth above, and further in view of Fumihiro. (Japan Patent JP 5187986, referred to as **Fumihiro**)

Claim 4.

Hsiung, and Maass do not teach summing step further comprises summing active inputs to a counter for every 20KHz clock cycle of said adder/comparator combination.

Fumihiro teaches summing step further comprises summing active inputs to a counter for every 20KHz clock cycle of said adder/comparator combination. (**Fumihiro,** ¶0021; Fumihiro illustrates a 20KHz cycle time.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify combined teachings of Hsiung, and Maass by specifying a rate which the invention cycles as taught by Fumihiro to have summing step further comprises summing active inputs to a counter for every 20KHz clock cycle of said adder/comparator combination.

For the purpose of illustrating the speed which the invention completes its function.

Claim 6.

Hsiung, and Maass do not teach sensing odorants using a plurality of IONFET odor receptors.

Fumihiro teaches sensing odorants using a plurality of IONFET odor receptors.(**Fumihiro,** ¶0020; 'IONFET odor receptors' of applicant is equivalent to 'multi-head quartz-resonator group' of Fumihiro.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify combined teachings of Hsiung, and Maass by the use of IONFET receptors as taught by Fumihiro to have sensing odorants using a plurality of IONFET odor receptors.

For the purpose of constructing an odor receptor array for the invention main function.

Claim 7.

Hsiung teachers receiving an input signal from an olfactory receptor. (**Hsiung,** ¶0129)

Hsiung does not teach summing said input from said receiving step; adding one to a clock cycle for every input signal from said receiving step; comparing values from said summing step and said adding step and comparing to a preselected threshold value; inputting an above threshold value from said summing step to a spike bus.

Maass teaches summing said input from said receiving step (**Maass,** p17, equation 1.12); adding one to a clock cycle for every input signal from said receiving step (**Maass,** p17, equation 1.12; Maass illustrates the summation per time interval '*t*'.); comparing values from said summing step and said adding step and comparing to a preselected threshold value (**Maass,** p17:9-13); inputting an above threshold value from said summing step to a spike bus. (**Maass,** p17:17-21; 'Spike bus' of applicant is equivalent to 'output' of Maass.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Hsiung by comparing summed values to a threshold to initiate a spike or not as taught by Maass to sum said input from said receiving step; adding one to a clock cycle for every input signal from said receiving step; comparing values from said summing step and said adding step and comparing to a preselected threshold value; inputting an above threshold value from said summing step to a spike bus.

For the purpose of illustrating standard procedures of a pulsed neural network.

Hsiung teaches determining whether value from said inputting step matches data on a synapse listing. (**Hsiung,** ¶0008; 'Synapse listing' of applicant is equivalent to 'model' of Hsiung.)

Hsiung and Maass do not teach adding values from said determining step that do not match data on said synapse listing to a noise counter; adding values from said determining step that do match data on said synapse list to a spike counter.

Fumihiro teaches adding values from said determining step that do not match data on said synapse listing to a noise counter .(**Fumihiro,** ¶0026; Adding values to noise counters is one side of training the pulsed neural network.); adding values from said determining step that do match data on said synapse list to a spike counter. (**Fumihiro,** ¶0026; Adding values to counters of a corresponding model is another side of training the pulsed neural network.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify combined teachings of Hsiung and Maass by adjusting the values to enforce correct determination and deter incorrect determinations as taught by Fumihiro to add values from said determining step that do not match data on said synapse listing to a noise counter; adding values from said determining step that do match data on said synapse list to a spike counter.

For the purpose of adjusting the invention for improved accuracy.

Hsiung does not teach outputting a signal associated with said spike counter after inputs to said spike counter reach a preselected threshold value.

Maass teaches outputting a signal associated with said spike counter after inputs to said spike counter reach a preselected threshold value. (**Maass,** p17:9-13) It would

have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Hsiung by firing a neuron after a threshold is reached as taught by Maass to output a signal associated with said spike counter after inputs to said spike counter reach a preselected threshold value.

For the purpose of determining a possible result.

Claim 9.

Hsiung and Maass do not teach determining step further comprises the step of determining whether value from said inputting step matches data on a synapse listing containing odor receptor signatures.

Fumihiro teaches determining step further comprises the step of determining whether value from said inputting step matches data on a synapse listing containing odor receptor signatures. (**Fumihiro,** ¶0014; 'Receptor signatures' of applicant is equivalent to 'pattern recognition' of Fumihiro.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify combined teachings of Hsiung and Maass by evaluating results for a final possible solution as taught by Fumihiro to determine step further comprises the step of determining whether value from said inputting step matches data on a synapse listing containing odor receptor signatures.

For the purpose of determining a final result.

Claim 10.

Hsiung teaches sensing odorants using a plurality of odor receptors (**Hsiung,** ¶0079); first converting output of said sensing step to binary data(**Hsiung,** ¶0180; 'Binary data' of applicant is equivalent to 'binary characteristics' of Hsiung.); second converting said binary data into spike trains comprising an adder/comparator combination having an input of zero representing a lack of odorant stimulus and an input of one representing an odorant stimulus (**Hsiung,** ¶0129 and ¶0180; Combining olfactory sensors, each with a specific domain illustrated in ¶0129 and binary characteristics of ¶0180 of Hsiung would be equivalent to 'zero represents lack of stimulus' and 'one represents odorant stimulus' of applicant.); summing active inputs to a counter for every clock cycle of said adder/comparator combination. (**Hsiung,** table 5, name histogram; Each time segment of the histogram is the summation of the number inputs from the sensors)

Hsiung does not teach adding one to every clock cycle of said adder/comparator for every zero input; posting a spike to a spike bus every time said counter reaches a specified threshold; resetting said counter to zero after said posting step.

Maass teaches adding one to every clock cycle of said adder/comparator for every zero input (**Maass,** p17, equation 1.12; Maass illustrates the summation per time interval '*t*'.); posting a spike to a spike bus every time said counter reaches a specified threshold (**Maass,** p17:9-13); resetting said counter to zero after said posting step. (**Maass,** p18:1-2) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Hsiung by firing a neuron when a threshold is reached and then resetting the threshold counter back to zero as

taught by Maass to adding one to every clock cycle of said adder/comparator for every zero input; posting a spike to a spike bus every time said counter reaches a specified threshold; resetting said counter to zero after said posting step.

For the purpose of setting the general guide lines for a pulsed neural network.

Hsiung and Maass do not teach training said spiking neural network to learn which combination of odor receptors is most prevalent; and associating a set of most prevalent odor receptors with an output neuron.

Fumihiro teaches training said spiking neural network to learn which combination of odor receptors is most prevalent (**Fumihiro, ¶0026**; 'Training' of applicant is equivalent to 'back propagation method' of Fumihiro.); and associating a set of most prevalent odor receptors with an output neuron. (**Fumihiro, ¶0026**; 'Associating odor receptors with an output' of applicant is equivalent to 'back-propagation' of Fumihiro.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify combined teachings of Hsiung and Maass by training the neural network as taught by Hsiung to train said spiking neural network to learn which combination of odor receptors is most prevalent; and associating a set of most prevalent odor receptors with an output neuron.

For the purpose of having an invention that can learn and adjust as needed.

Claim 11.

Hsiung teaches a plurality of odor receptors for sensing odorants (**Hsiung, ¶0079**); means for converting output of said odor receptors to binary data(**Hsiung,**

¶0180; 'Binary data' of applicant is equivalent to 'binary characteristics' of Hsiung.); a spiking neural network for receiving said binary data comprising: a plurality of potentiated synapses, wherein the weight of an off synapse is zero and the weight of an on synapse is one (**Hsiung,** ¶0129 and ¶0180; Combining olfactory sensors, each with a specific domain illustrated in ¶0129 and binary characteristics of ¶0180 of Hsiung would be equivalent to 'weight of an off synapse is zero' and 'weight of an on synapse is one' of applicant.); a counter for adding positive weights from said potentiated synapses. (**Hsiung,** table 5, name histogram; Each time segment of the histogram is the summation of the number inputs from the sensors. This is equivalent to adding positive weights from potentiated synapses of applicant.)

Hsiung does not teach a threshold comparator for determining when said counter has reached a preselected threshold value.

Maass teaches a threshold comparator for determining when said counter has reached a preselected threshold value. (**Maass,** p17:9-13) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to the teachings of Hsiung by having a function that determines if a threshold has been reached as taught by Maass to have a threshold comparator for determining when said counter has reached a preselected threshold value.

For the purpose of determining if a neuron is to be fired or not.

Hsiung and Maass do not teach a training program for training said spiking neural network to learn which combination of odor receptors is most prevalent; and a specified output neuron specified by which set of odor receptors are most prevalent.

Fumihiro teaches a training program for training said spiking neural network to learn which combination of odor receptors is most prevalent (**Fumihiro, ¶0026**; 'Training' of applicant is equivalent to 'back propagation method' of Fumihiro.); and a specified output neuron specified by which set of odor receptors are most prevalent. (**Fumihiro, ¶0026**; 'Associating odor receptors with an output' of applicant is equivalent to 'back-propagation' of Fumihiro.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify combined teachings of Hsiung and Maass by determine which receptor is most prevalent as taught by Fumihiro to have a training program for training said spiking neural network to learn which combination of odor receptors is most prevalent; and a specified output neuron specified by which set of odor receptors are most prevalent.

For the purpose of training with an established set which receptors are most prevalent.

Claim 12.

Hsiung teaches a spike bus providing synchronization logic (**Hsiung, ¶0066**; Neural networks run in parallel which is equivalent to 'synchronization logic' of applicant.); a priority encoder for connecting an input signal from said spike bus (**Hsiung, ¶0456**; 'Priority encoder' of applicant is equivalent to 'security requirements' of Hsiung.) and for posting address of said input signal on said spike bus (**Hsiung, ¶0456**; 'Posting address' of applicant is equivalent to 'IP address' of Hsiung.); and a potentiated synapse list for connecting neuron modules in parallel to said spike bus. (**Hsiung,**

¶0008; The design of a neural network is one that runs in parallel. 'Synapse listing' of applicant is equivalent to 'model' of Hsiung.)

Claim 13.

Hsiung and Maass do not teach said potentiated synapse list further comprises a potentiated synapse list comprising odor receptor signatures.

Fumihiro teaches said potentiated synapse list further comprises a potentiated synapse list comprising odor receptor signatures. (**Fumihiro,** ¶0014; 'Receptor signatures' of applicant is equivalent to 'pattern recognition' of Fumihiro.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify combined teachings of Hsiung and Maass by having a set of final possible results as taught by Fumihiro to have potentiated synapse list further comprises a potentiated synapse list comprising odor receptor signatures.

For the purpose of the invention to have a set of possible results which the signatures of odor determines.

Claim Rejections - 35 USC § 103

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Hsiung, Maass, and Fumihiro, as set forth above, and further in view of Al-Nsour. ('MOS Fully Analog Reinforcement Neural Network Chip', referred to as **Al-Nsour**)

Claim 5.

Hsiung, Maass and Fumihiro do not teach sensing step further comprises sensing odorants using a plurality of CHEMFET odor receptors.

Al-Nsour teaches sensing step further comprises sensing odorants using a plurality of CHEMFET odor receptors. (**Al-Nsour,** p239 C1:13-22; Pentane, methanol and acetone are chemicals.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify combined teachings Hsiung, Maass and Fumihiro by using CHEMFET receptors as taught by Al-Nsour to have sensing step further comprises sensing odorants using a plurality of CHEMFET odor receptors.

For the purpose of using an industrial standard sensing instrument.

Conclusion

6. The prior art of record and not relied upon is considered pertinent to the applicant's disclosure.

-Reinforcement Learning Neural Networks Circuits for Electronic Nose':Abdel-Aty-Zohdy

-'Intelligent Informatin Processing Using Neural Networks and Genetic Algorithms'

-'Using Neural Networks and Genetic Algorithms to Enhance Performance in an Electronic Nose': Kermani

-U. S. Patent Publication 20020023066: Fu

-U. S. Patent 6763339: Fu

-U. S. Patent 6760716: Ganesamoorthi

-U. S. Patent 6192351: Persaud

-'ANN Digitally Programmable Analog Synapse': Al-Nsour

-'Desing Aproach for Bio-medical Smart Sensors': Ewing

-'Artificial Neural Network Electronic Nose for Volatile Organic Compounds': Abdel-Aty-Zohdy

-'Digital Neural Processing Unit for Electronic Nose': Abdel-Aty-Zohdy

-'A recurrent dynamic neural network for noisy signal representation': Zohdy

-U. S. Patent Publication 20030127105: Fontana

-U. S. Patent Publication 2002345857

-U. S. Patent Publication 2003336095

'Signal perception and processing with bioinspired sub-micro-systems': Abdel-Aty-Zohdy

-'Spiking Networks for Biochemical Detection': Allen

-'Sequence Learning and Planning on Associative Spiking Neural Networks': Atsumi

-U. S. Patent 5799102: Leong

-U. S. Patent Publication 20020184569: O'Neill

-Japan patent Publication JP 11271204: Matsumoto

7. Claims 1-13 are rejected.

Correspondence Information

8. Any inquiry concerning this information or related to the subject disclosure should be directed to the Examiner Peter Coughlan, whose telephone number is (571) 272-5990. The Examiner can be reached on Monday through Friday from 7:15 a.m. to 3:45 p.m.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor David Vincent can be reached at (571) 272-3687. Any response to this office action should be mailed to:

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(571) 273-8300 (for formal communications intended for entry.)

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Peter Coughlan

5/30/2006